CLAIMS

1. A network system of radio base stations comprising base stations provided in a plurality of cells and a control station controlling the base stations, in which the base stations and the control station are connected by optical fibers using a wavelength multiplexing transmission method, wherein:

the base station comprises a variable-wavelength transmitter for transmitting an optical signal having a predetermined wavelength, and an optical coupler for combining optical signals from the variable-wavelength transmitter in order to transmit the optical signals using the wavelength multiplexing transmission method;

the control station comprises a plurality of optical receivers for receiving wavelengths of the optical signals transmitted using the wavelength multiplexing transmission method, and an optical coupler for splitting the wavelength-multiplexed optical signals transmitted from the base stations to the optical receivers by wavelength; and

when the radio communication terminal communicating with the base station moves and changes the base station to communicate with, a new base station which communicates with the radio communication terminal after a movement of the radio communication terminal controls the wavelength of the variable-wavelength transmitter, and then transmits the optical signals to the control station with the same wavelength as one used for transmitting by a previous base station which communicates with the radio communication terminal before the movement.

2. The network system of radio base stations as claimed in claim 1, characterized in

that:

the optical coupler provided in the base station splits off only a particular wavelength from the optical signals with a plurality of wavelengths to be transmitted using the wavelength multiplexing transmission method, and the base station further comprises an optical receiver for receiving optical signals split off by the optical coupler;

the control station further comprises a plurality of variable-wavelength optical transmitters for transmitting the optical signals used in the wavelength multiplexing transmission method, and the optical coupler provided in the control station combines the optical signals from the variable-wavelength optical transmitter in order to transmit the optical signals with the wavelength multiplexing transmission method; and

when the radio communication terminal communicating with the base station moves and changes the base station to communicate with, the control station controls the wavelength of the variable-wavelength transmitter, and then transmits the optical signals to the new base station with a wavelength intended for use by the new base station.

3. The network system of radio base stations as claimed in claim 1, characterized in that:

the optical coupler provided in the base station is a variable optical coupler and varies a wavelength to be split off from the optical signals having a plurality of wavelengths transmitted using the wavelength multiplexing transmission method, and the base station comprises an optical receiver for receiving the optical signals split off by the variable optical coupler; and

when the radio communication terminal communicating with the base station moves and changes the base station to communicate with, the control station does not change the wavelength of the optical signals to be transmitted to the base station even when the radio communication terminal changes the base station to be communicate with, and the new base station splits off and receives the optical signals of the same wavelength from the control station with the variable optical coupler.

4. The network system of radio base stations as claimed in each of claims 1-3, characterized in that:

the base station further comprises a radio signal demodulator for mobile communication for demodulating radio signals received from the radio communication terminal and for converting the demodulated signals into digital signals, an optical transmitter for converting the digital signals intended for the control station converted by the radio signal demodulator for mobile communication into optical signals to be transmitted using the wavelength multiplexing transmission method, an optical receiver for receiving optical signals transmitted by wavelength-multiplexing from the control station, and a radio signal modulator for mobile communication for converting the digital signals converted by the optical receiver into radio frequency signals for mobile communication; and

the control station further comprises an optical receiver for converting the optical signals received from the base station and transmitted using the wavelength multiplexing transmission method into digital signals, and an optical transmitter for converting digital signals intended for the base station into wavelength-multiplexed optical

signals.

5. The network system of radio base stations as claimed in each of claims 1-3, characterized in that:

the base station further comprises a radio signal demodulator for mobile communication for demodulating radio signals for mobile communication received from the radio communication terminal and for converting the demodulated signals into digital signals, an entrance radio signal modulator for converting the digital signals converted by the radio signal demodulator for mobile communication into entrance radio signals, an optical transmitter for converting the entrance radio signals converted by the entrance radio signal modulator into optical signals in order to transmit the optical signals using the sub-carrier optical transmission method, an optical receiver for converting the entrance radio signals transmitted using the sub-carrier optical transmission method into electrical signals, an entrance radio signal demodulator for converting the converted electrical entrance radio signals into digital signals, a radio signal modulator for mobile communication for converting the digital signals converted by the entrance radio signal demodulator into radio frequency signals for mobile communication; and

the control station further comprises an optical receiver for converting optical signals transmitted with the entrance radio signals sent from the base station using the sub-carrier optical transmission method into electrical signals, an entrance radio signal demodulator for converting the converted electrical entrance radio signals into digital signals, an entrance radio signal modulator for converting the digital signals intended for base

stations into the entrance radio signals, and an optical transmitter for converting the entrance radio signals converted by the entrance radio signal modulator into optical signals in order to transmit the optical signals using the sub-carrier optical transmission method.

6. The network system of radio base stations as claimed in each of claims 1-3, characterized in that:

the base station further comprises an optical transmitter for converting radio signals received from the radio communication terminal into optical signals in order to transmit the optical signals using the sub-carrier optical transmission method, and an optical receiver for converting optical signals transmitted with radio signals received from the control station using the sub-carrier optical transmission method into electrical signals; and

the control station further comprises an optical receiver for converting optical signals transmitted with radio frequency signals for mobile communication using the sub-carrier optical transmission method into electrical signals, a radio signal demodulator for mobile communication for converting the converted electrical radio frequency signals for mobile communication into digital signals, a radio signal demodulator for mobile communication for converting the digital signals intended for the base stations into radio frequency signals for mobile communication, and an optical transmitter for converting the radio frequency signals for mobile communication converted by the radio signal demodulator for mobile communication into optical signals to be transmitted using the sub-carrier optical transmission method.

7. A network system of radio base stations comprises base stations provided in a plurality of cells and a control station controlling the base stations, in which the base stations and the control station are connected by optical fibers with a sub-carrier optical transmission, wherein:

the base station comprises a radio signal demodulator for mobile communication for demodulating radio signals for mobile communication received from the radio communication terminal and for converting the demodulated signals into digital signals, a variable-frequency entrance radio signal modulator for converting the signals converted by the radio signal demodulator for mobile communication into entrance radio signals, an optical receiver for converting radio signals transmitted from the control station or other base stations using the sub-carrier optical transmission method into electrical signals, and a coupler for combining an output of the optical receiver and an output of the variable-frequency entrance radio signals modulator;

the control station comprises: an optical receiver for converting optical signals transmitted with the entrance radio signals using the sub-carrier optical transmission method into electrical signals, a selective-frequency coupler for splitting off the outputs from the optical receiver by frequency, and an entrance radio signal demodulator for converting each entrance radio signal split off by the selective-frequency coupler into digital signals; and

when the radio communication terminal communicating with the base station moves and changes the base station to communicate with, a new base station which communicates with the radio

communication terminal after a movement of the radio communication terminal controls a carrier frequency of the variable-frequency entrance radio signals modulator, and transmits the entrance radio signals to the control station on the same frequency as one used for transmitting by a previous base station which communicates with the radio communication terminal before the movement.

8. The network system of radio base stations as claimed in claim 7, characterized in that:

the base station comprises an optical receiver for converting the entrance radio signals transmitted using the sub-carrier optical transmission method into electrical signals, a selective-frequency coupler for splitting off a predetermined frequency signal from the outputs of the optical receiver, an entrance radio signal demodulator for converting the entrance radio signals split off by the selective-frequency coupler into digital signals, and a radio signal modulator for mobile communication for converting the digital signals converted by the entrance radio signal demodulator into radio frequency signals for mobile communication;

the control station comprises a variable-frequency entrance radio signal modulator for converting digital signals intended for base stations into the entrance radio signals, a coupler for combining the output of the variable-frequency entrance radio signal modulator, and an optical transmitter for converting the entrance radio signals converted by the entrance radio signal modulator into optical signals in order to transmit the optical signals using the sub-carrier optical transmission method; and

when the radio communication terminal communicating with the base station moves and changes the base station to communicate with, the control station controls and converts the carrier frequency of the variable-frequency entrance radio signal modulator that converts the digital signals intended for base stations into the entrance radio signals, into the entrance radio frequency intended for use by the new base station.

9. The network system of radio base stations as claimed in claim 7, characterized in that:

the base station further comprises an optical receiver for converting radio signals having a plurality of frequencies and transmitted using the sub-carrier optical transmission method into electrical signals, a variable selective-frequency coupler for splitting off only predetermined frequencies, and a radio signal modulator for mobile communication for converting the electrical signals split off by the variable selective-frequency coupler into radio frequency signals for mobile communication;

the control station further comprises a plurality of entrance radio signal modulators for converting the digital signals intended for the base stations into entrance radio signals, a coupler for multiplexing the electrical signals from the entrance radio signal modulators, and an optical transmitter for converting outputs of the coupler into optical signals in order to transmit the optical signals using the sub-carrier optical transmission method; and

when the radio communication terminal communicating with the base station moves and changes the base station to communicate with, the

control station does not change the carrier frequency of the variable-frequency entrance radio signal modulator even when the radio communication terminal changes the base station to be communicated with and the new base station changes the frequency for splitting in the variable selective-frequency coupler into a frequency of the entrance radio signal intended for use of the previous base station.

10. The network system of radio base stations as claimed in each of claims 1-9, characterized in that:

the network system of radio base stations is organized in a loop structure, wherein the network system comprises the base stations provided in the plurality of cells and the control station controlling the base stations, in which the base stations and the control station are connected by the optical fibers.

11. The network system of radio base stations as claimed in each of claims 1-9, characterized in that:

the network system of radio base stations is organized in a mesh structure, wherein the network system comprises the base stations provided in the plurality of cells and the control station controlling the base stations, in which the base stations and the control station are connected by the optical fibers.

12. The network system of radio base stations as claimed in each of claims 1-9, characterized in that:

the network system of radio base stations is organized in a cluster structure, wherein the network system comprises the base stations provided

in the plurality of cells and the control station controlling the base stations, in which the base stations and the control station are connected by the optical fibers.

13. The network system of radio base stations as claimed in claim 12, characterized in that:

the network system of radio base stations further comprises an upper-level control station for controlling cluster control stations; and

when the radio communication terminal communicating with the base station moves and changes the cluster to communicate with, a cluster control station used by the radio communication terminal before the movement transmits signals sent from the radio communication terminal to a new cluster control station which communicates with the radio communication terminal after the movement via the upper-level control station with the same wavelength as one used for transmitting optical signals by the previous base station, and the new cluster control station transmits signals sent from the radio communication terminal to the new cluster control station with the same wavelength as one used for transmitting optical signals by the previous base station.

14. The network system of radio base stations as claimed in claim 12, characterized in that:

the network system of radio base stations further comprises an upper-level control station for controlling cluster control stations;

when the radio communication terminal communicating with the base station moves and changes the cluster to communicate with, a previous

cluster control station which communicates with the radio communication terminal before the movement transmits signals intended for the radio communication terminal via the upper-level control station and a new cluster control station on the same wavelength as one used for transmitting optical signals to the previous base station, and the new cluster control station transmits signals intended for the radio communication terminal to the new cluster control station with the same wavelength as one used for transmitting optical signals to the previous base station.

15. The network system of radio base stations as claimed in one of claim 13 or 14, characterized in that:

the upper-level control station comprises an optical wavelength converting part; and

when a wavelength of the optical signals used for transmission to the previous base station is used in the new cluster, the upper-level control station converts the wavelength into one that is not being used in the new cluster by the wavelength converting part, and transmits the optical signals to the cluster control station in the new cluster.

16. A network system of radio base stations comprising a plurality of base stations communicating with radio communication terminals, a control station comprehensively controlling the base stations and communicating with an external communication network, and optical fiber lines connecting the base stations and the control station, in which each of the base stations receives signals transmitted by the radio communication terminal, converts the received signals into optical signals, and then transmits the converted optical signals to

the control station via the optical fiber lines; wherein:

each of the base stations comprises a signal converting part for converting signals transmitted from the radio communication terminal into optical signals having different wavelengths assigned particularly to each of the sending radio communication terminals; and

the control station comprises an optical signal receiving part for receiving via the optical fiber lines near-simultaneously optical signals having an identical wavelength that are converted respectively by the signal converting part from signals transmitted from the same radio communication terminal and received by at least two base stations, and for converting the received signals into electrical signals to be output, and an equalizing part for equalizing the output signals.

17. The network system of radio base stations as claimed in claim 16, characterized in that:

each of the base stations and the control station are connected in a loop structure.

18. The network system of radio base stations as claimed in claim 16, characterized in that:

each of the base stations and the control station are connected in a mesh structure.

19. The network system of radio base stations as claimed in claim 16, characterized in that:

each of the base stations and the control station are connected in a cluster structure.

20. The network system of radio base stations as claimed in each of claims 16-19, characterized in that:

a wavelength multiplexing transmission method is applied to the communication between each of the base stations and the control station.

21. The network system of radio base stations as claimed in each of claims 16-19, characterized in that:

a sub-carrier optical transmission method is applied to the communication between each of the base stations and the control station, each of which sub-carrier optical signals carries signals frequency-multiplexed from the entrance radio signals.

22. The network system of radio base stations as claimed in each of claims 16-19, characterized in that:

a sub-carrier optical transmission method is applied to the communication between each of the base stations and the control station, each of which sub-carrier optical signals carries signals frequency-multiplexed from access radio signals, wherein the access radio signal is used for radio communication between each base station and the radio communication terminals.

23. A control station which controls a network system of radio base stations comprising a plurality of base stations communicating with radio communication terminals, and optical fiber lines, further comprising:

an optical signal receiving part for receiving via the optical fiber lines

near-simultaneously optical signals having a different wavelength assigned particularly to each sending radio communication terminal that are converted respectively by the signal converting part from signals transmitted from an identical radio communication terminal and received by at least two base stations, and for converting the received signals into electric signals to be output; and

an equalizing part for equalizing the output signals.

24. A method for switching of base stations in a network system of radio base stations comprising base stations provided in a plurality of cells and a control station controlling the base stations, in which the base stations and the control station are connected by optical fibers, wherein:

a wavelength for transmission from the base station to the control station is set at the beginning of a communication between the base station and the radio communication terminal, and this wavelength for transmission is fixed while the radio communication terminal is communicating; and

even when the radio communication terminal moves and changes the base station to communicate with, a new base station which communicates with the radio communication terminal after a movement of the radio communication terminal transmits information from the radio communication terminal to the control station on the wavelength for transmission set for the radio communication terminal.

25. A method for switching of base stations in a network system of radio base stations comprising base stations provided in a plurality of cells and a control station controlling the base

stations, in which the base stations and the control station are connected by optical fibers, wherein:

the control station comprises a variable-wavelength transmitter; and

a different wavelength for transmission from the control station to the base station is set for each base station, and when the radio communication terminal moves and changes the base station to communicate with, the control station controls a wavelength of the variable-wavelength transmitter and transmits information intended for the radio communication terminal to a new base station which communicates with the radio communication terminal after a movement of the radio communication terminal, on the wavelength for transmission set for a new base station which communicates with the radio communication terminal after the movement.

26. A method for switching of base stations in a network system of radio base stations comprising base stations provided in a plurality of cells and a control station controlling the base stations, in which the base stations and the control station are connected by optical fibers, wherein:

a different wavelength for transmission from the control station to the base station is set for each base station, and when the radio communication terminal moves and changes the base station to communicate with, the control station transmits information of the radio communication terminal to a new base station which communicates with the radio communication terminal after a movement of the radio communication terminal on the wavelength for transmission set for a previous base station which communicates with the radio communication terminal before the movement.

27. A method for switching of base stations in a network system of radio base stations comprising base stations provided in a plurality of cells and a control station controlling the base stations, in which the base stations and the control station are connected by optical fibers with a sub-carrier optical transmission, wherein:

an entrance radio signal for a sub-carrier optical transmission from the base station to the control station is set at the beginning of a communication between the base station and a radio communication terminal, and the entrance radio signal is fixed while the radio communication terminal is communicating; and

even when the radio communication terminal moves and changes the base station to communicate with, a new base station which communicates with the radio communication terminal after a movement of the radio communication terminal transmits information of the radio communication terminal to the control station with the entrance frequency signal set for the radio communication terminal using the sub-carrier optical transmission method.

28. A method for switching of base stations in a network system of radio base stations comprising base stations provided in a plurality of cells and a control station controlling the base stations, in which the base stations and the control station are connected by optical fibers with the sub-carrier optical transmission, wherein:

a different entrance radio signal sent from the control station to the base station is set for each base station; and

when the radio communication terminal

moves and changes the base station to communicate with, the control station transmits information intended for the radio communication terminal to a new base station which communicates with the radio communication terminal after a movement of the radio communication terminal with the entrance radio signal set for the new base station using the sub-carrier optical transmission method.

29. A method for switching of base stations in a network system of radio base stations comprising base stations provided in a plurality of cells and a control station controlling the base stations, in which the base stations and the control station are connected by optical fibers with a sub-carrier optical transmission, wherein:

a different entrance radio signal sent from the control station to the base station is set for each base station; and

when the radio communication terminal moves and changes the base station to communicate with, a new base station which communicates with the radio communication terminal after a movement of the radio communication terminal transmits information of the radio communication terminal to the control station using the sub-carrier optical transmission method with an entrance frequency signal set for a previous base station which communicates with the radio communication terminal before the movement.

30. A method for signal processing in a network system of radio base stations comprising a plurality of base stations communicating with radio communication terminals, a control station comprehensively controlling the base stations and communicating with an external communication network, and optical fiber lines connecting the base

stations and the control station, comprising the steps of:

in each of the base stations, receiving signals transmitted from the radio communication terminal, converting the received signals into optical signals having different wavelengths assigned particularly to each of the sending radio communication terminals, and transmitting the converted signals to the control station via the optical fiber lines; and

in the control station, receiving via the optical fiber lines near-simultaneously optical signals having an identical wavelength that are converted from signals transmitted from the same radio communication terminal and received by at least two base stations, converting the received signals into electric signals, and equalizing the electric signals.

31. A method for handover control when signals are processed according to the signal processing method as claimed in claim 30, further comprising the steps of:

monitoring the condition of connection shown by the received optical signals that have an identical wavelength and are received near-simultaneously by the control station, and determining whether the control station can terminate the handover process based on results of the monitoring; and

establishing or sustaining a communication between the control station and the radio communication terminal under handover based on the equalized signals.